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Case Report

Dual approach for internal fixation of a complex talar fracture in a 20-year-old male

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ABSTRACT

Talus bone plays a pivotal role in foot and ankle function. Due to its inherent blood supply, talar fracture poses high risk of AVN (avascular necrosis). The objective of this case report was to provide valuable insights into the surgical management of this unique talar fracture, shedding light on the efficacy of specific surgical techniques and the absence of avascular necrosis in the patient's 18-month postoperative follow-up. By detailing the distinct characteristics and management of this complex talar fracture, we hope to contribute to the existing body of knowledge on talus fractures and aid in the development of improved treatment approaches for similar cases. A 20-year-old male with a history of fall, presented to hospital after 1 day of fall with swelling, tenderness around foot and ankle, ecchymosis. the patient was evaluated in the form of imaging and blood work up and planned for surgery. open reduction and internal fixation were done with Herbert screws. talus was approached through anteromedial and anterolateral incisions without medial malleolus osteotomy. Identification of fracture patterns is crucial for management and outcome. Dual incision facilitates disimpaction, accessing talar dome area. At 18 months the outcome was satisfactory painless ROM, with no signs of AVN.

Keywords: Talus fracture, Dual approach, Medial malleolus osteotomy

INTRODUCTION

Talus bone plays a pivotal role in foot and ankle function. Due to its inherent blood supply, talar fracture poses high risk of AVN (avascular necrosis). So talar fractures require specific attention to avoid AVN, and post traumatic arthritis.

Talus fracture is a relatively rare injury. This fracture accounts for 0.1-2.5% of all fractures, and 3.5% of ankle and foot fractures. True incidence is unidentified because sensitivity of talus fracture to routine radiography is only 74 %.[1,2]

The classification of talar fractures has been extensively studied and described by various authors, such as Hawkins and Canale, Butel, and Coltart, among others. Additionally, the 2011 SOO classification system has provided valuable insights into the diversity of talar fracture patterns, aiding in the understanding and classification of complex fractures.

The objective of this case report was to provide valuable insights into the surgical management of this unique talar fracture, shedding light on the efficacy of specific surgical techniques and the absence of avascular necrosis in the patient's 18-month postoperative follow up. By detailing the distinct characteristics and management of this complex talar fracture, we hope to contribute to the existing body of knowledge on talus fractures and aid in the development of improved treatment approaches for similar cases.

The classification of talus fractures is instrumental for guiding clinical decision-making and predicting outcomes.

There are several systems developed by various authors to classify these injuries.

Hawkins-Canale classification[3,4]

This system is specific to talar neck fractures and includes four types based on the displacement and associated dislocations. The Hawkins sign, a subchondral radiolucency seen on X-rays, can indicate vascular integrity. Risks of osteonecrosis increase with higher fracture types, ranging from 0-15% in type I to almost 100% in types III and IV.[10]

Sneppen classification[5]

This pertains to fractures of the talus body and categorizes them into six types (A through F) based on the fracture pattern, such as compression, shear, or crush injuries. Each type gives an idea about the mechanism of injury and provides insights into the complexity of the fracture.[10]

2011 SOO classification[6,7]

A comprehensive classification for all talar fractures, dividing them into partial fractures (affecting the head, lateral process, posterior process, and dome) and central fractures (involving the neck and frontal talar body). It specifies the degree of displacement and the involvement of surrounding joints and soft tissues.

Table 1: Partial and central types.

Types	Description
Partial	Head, lateral process, posterior process, dome
Central	Neck and frontal talar body fractures: Type 0: displacement < 2 mm Type I: displacement of 2 mm or more Type II: with posterior ST subluxation or dislocation Type III: with posterior ST and TT dislocation (enucleation) Type IV: with ST or TT dislocation and TN subluxation or dislocation "True" body fractures: sagittal, horizontal, comminuted Add C (complex) if the nearby structure is also fractured (tibial plafond, malleoli, calcaneus, cuboid, navicular, etc.) Add A (simple fracture) or B (comminuted)

All these classifications aim to estimate the risk of complications such as avascular necrosis and aid in selecting the appropriate treatment, which often involves open reduction and internal fixation, especially for displaced fractures to preserve talar blood supply and prevent long-term dysfunction.

The choice of classification may vary depending on the specific clinical scenario, as each offers different levels of detail and prognostic information. It's essential for both clinicians and researchers to be familiar with these classification systems when dealing with talar fractures for consistent reporting and treatment planning.

Untreated talar fractures present significant risks due to the bone's unique structure and function in the ankle and foot.

Potential complications[8]

Avascular necrosis

The talus relies heavily on its blood supply from the arteries in the talar neck and surrounding vessels. Fractures, especially when displaced, can disrupt these vessels and lead to AVN, which is the death of bone tissue due to a lack of blood flow.[9,10]

Arthritis

A fracture that is not properly treated can lead to abnormal joint surfaces and altered biomechanics in the foot and ankle. This increases the likelihood of developing post-traumatic arthritis with symptoms like pain, stiffness, and decreased mobility.[9]

Malunion or nonunion

If a fractured bone does not heal properly (malunion) or fails to heal (nonunion), it can result in chronic pain, deformity, and functional impairment, requiring more complex surgical interventions.

Chronic pain and swelling

Persistent symptoms such as pain and swelling can be a direct result of an untreated fracture due to ongoing inflammation and bone instability.[9]

Reduced mobility

A malunion or nonunion of the talus can severely restrict the range of motion in the ankle and foot, affecting gait and the ability to perform weight-bearing activities.[9]

Altered foot biomechanics

The misalignment of the talus due to an untreated fracture can affect the overall biomechanics of the foot. This can lead to secondary problems such as tendonitis or collapse of the foot arch.[10]

Because of these potential complications, proper diagnosis and timely treatment of talar fractures are crucial to maintain foot and ankle function and to minimize the risk of long-term damage.[10]

CASE REPORT

A 20-year-old male presented to OPD with left ankle swelling and pain. The patient had suffered a fall from

stairs 1 day prior, on examination the patient had swelling, tenderness over anteromedial and lateral aspect of the ankle. There were ecchymosis and redness around the foot region. Ankle range of motion was painful and restricted, toe rom limited. The patient had intact neurovascular status, though the power of flexor and extensor compartment was limited due to pain. Radiograph and 3d CT scan was done. It showed a displaced biplanar intra-articular fracture of the body of the talus with extension into the neck. The neck of the talus showed comminution. The subtalar and talonavicular joints were intact. Primary immobilization was done with posterior splint (Figure 1).

Figure 1: Primary immobilization was done with posterior splint.

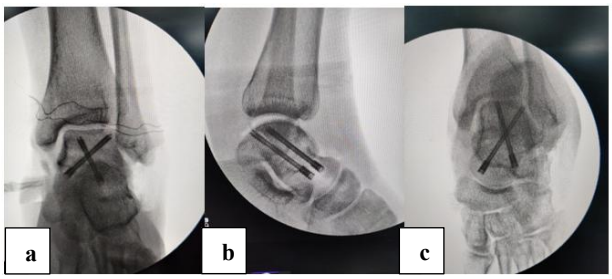

Figure 2: (a) AP view; (b) lateral view; (c) canale view.

After regular pre op work up, the patient was taken to the operation theater, the patient had surgery open reduction and internal fixation of talus using two incision techniques. The first incision on the medial side, extending from the medial malleolus towards the navicular bone. Second incision was on the lateral aspect of the ankle, in front of the distal fibula extending to 4th metatarsal bone. Medial malleolus osteotomy was not done. These two incisions facilitated disimpaction of fracture, realign, and visualise fracture pattern. After disimpaction, alignment was achieved and held with 2 temporary k wires. 3.5 mm headless screw used to fix the fracture, one from an anteromedial aspect and other from anterolateral aspect. Reduction confirmed under fluoroscopy. After wound closure posterior splint was given with limb elevation for edema to subside. Post op radiograph was done (Figure 2).

Figure 3: (a) 2 months post op ap view; (b) lateral view.

Figure 4: Regular follow up radiographs taken at 2 months, 6 months and 18 months interval.

The patient followed up in OPD, short leg cast applied after suture removal for 2 months. Regular follow up radiographs taken at 2 months, 6 months and 18 months interval (Figure 3 and 4).

The patient had good recovery, physical therapy started at 2 months following cast removal. Full range of motion achieved in 8 weeks post cast removal, plantarflexion 40 degrees, dorsiflexion 20 degree achieved. Till 3 months the patient was non weight bearing, weight bearing started at 3 months as tolerated. At 6 months the patient was full weight bearing without support, and the patient had no pain. At 18 months the patient was full weight bearing with no pain at the affected joint. There was no radiological evidence of avascular necrosis and post traumatic arthritis at these follow ups. The patient's AOFAS Ankle Hindfoot Score was at 18 months, 99/100, an improvement from 85/100 at the 6-month visit. At 18 months the outcome was satisfactory painless ROM, with no signs of AVN. the patient was able to do all his activities of daily living and already returned to his work as office attendant.

DISCUSSION

The main challenge for this case was disimpaction, maintaining articular alignment and stable fixation. Malunion or articular incongruence is ill tolerated in talus fracture, <3 degrees.

The fracture pattern like this, makes the surgeon think about what is the best possible option for fixation and from which approach to give the best possible results. As suggested by Dale et al talar body fractures are more common than neck fractures.[1] They have defined body fractures as a fracture posterior to the line drawn anterior to the talar dome and the lateral process.[1] Inokuchi et al gave definition of talar neck fracture as a fracture crossing the lateral entrance of the tarsal sinus on the inferior surface of the talus, regardless of whether or not it crossed over the anteromedial aspect of the trochlea of the talus, while talar body fractures are a fracture crossing the lateral border of the posterior subtalar joint.[2]

Williams et al gave comparisons of intra and interobserver of Canale et al and AO/OTA classifications, and found moderate inter- and intra-observer correlations for the fracture classifications and analysis of fracture lines. Based on their analysis, they proposed a composite system the 2011 SOO classification for talar fractures.[4-6]

Campbell et al in their case series concluded that the order in which the approaches were used does not make a significant difference, so the surgeon can choose on his own judgement. Also, dual incisions allowed access to more than 70% and 85% talar dome surface area, without and with distraction respectively. These results may promote soft tissue-only treatment strategies in talar body fracture care with an extensible exposure of the talar dome surface. Careful preoperative planning optimizes the advantages of this approach.[3]

It's important to differentiate and classify talar neck and body fracture, since each fracture pattern demands a different surgical approach and has different outcomes. For nondisplaced fractures without joint dislocation the risk of AVN can be around 15%. Whereas for displaced fracture its around as high as 50%.[11]

CONCLUSION

Identification of fracture patterns is crucial for management and outcome. Dual incision facilitates disimpaction, accessing talar dome area. At 18 months the outcome was satisfactory painless ROM, with no signs of AVN.

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